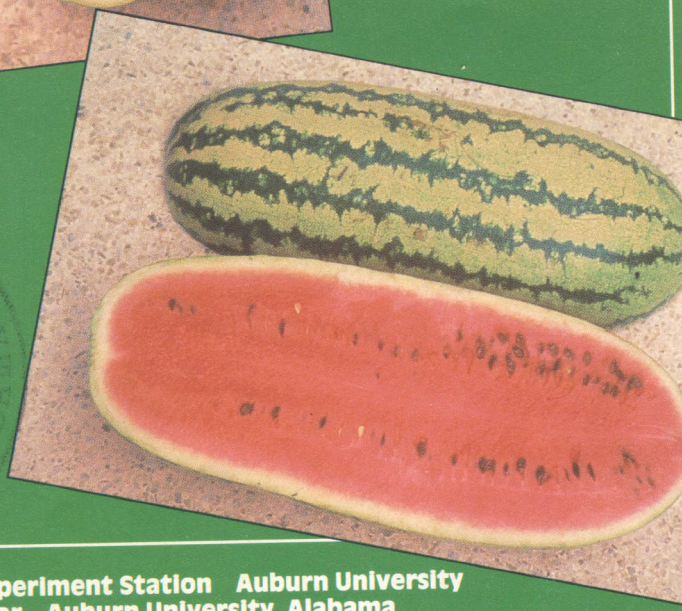
AU-Jubilant & AU-Producer

Quality, Disease-Resistant Watermelon Varieties for the South

Circular 280
June 1985



Alabama Agricultural Experiment Station Auburn University
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COVER PHOTO. Watermelon varieties developed at the Alabama Agricultural Experiment Station: AU-Producer, top, and AU-Jubilant, bottom.

FIRST PRINTING 4M, JUNE 1985

AU-Jubilant & AU-Producer
Quality, Disease-Resistant Watermelon Varieties for the South

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AU-JUBILANT AND AU-PRODUCER are new multiple disease-resistant watermelon varieties adapted to growing conditions in the Southeastern United States. They have resistance to anthracnose (*Colletotrichum laginarium*, race 2), Fusarium wilt (*Fusarium oxysorium niveum*), and gummy stem blight (*Didymella bryoniae*).

Disease is a major factor limiting production of watermelon in Alabama. Anthracnose, Fusarium wilt, and gummy stem blight are three of the most serious diseases. Severe crop losses and reduced yields of melons have resulted from these diseases in certain fields in Alabama. Although the damage seems to be more widespread in the Gulf Coast area, there have been frequent reports of damage in central and north Alabama.

Although satisfactory control of anthracnose and gummy stem blight may be accomplished with the proper application of organic fungicides during normal weather conditions, no control measure is effective during periods of high humidity and excessive rainfall. Furthermore, the three leading varieties, Charleston Gray, Jubilee, and Crimson Sweet, are not resistant to race 2 anthracnose or gummy stem blight (*1,2,6*).

VARIETY DEVELOPMENT

The discovery that certain plant introductions (PI 189225 and PI 271778) were resistant to race 2 anthracnose (5) and gummy stem blight (*3,4*) led to the initiation of an Alabama Agricultural Experi-

[1]Respectively, Professor, Research Associate, Associate Professor, and Professor of Horticulture.

ment Station watermelon breeding program to develop multiple disease-resistant breeding lines that produce high yields of excellent quality fruit. Two of these lines, AU-1 and AU-3, are currently being released as AU-Jubilant and AU-Producer, respectively, see cover illustration.

Origin

AU-Jubilant is an inbred line from the cross of Jubilee x PI 271778, and AU-Producer is an inbred line from the cross of Crimson Sweet x PI 189225. Following the crosses, backcrossing and disease screening programs were followed with selection of disease-resistant seedlings that produced high yields of excellent quality fruit. Thus, AU-Jubilant and AU-Producer originated from programs of backcrossing and inbreeding to obtain resistance to race 2 anthracnose, Fusarium wilt, and gummy stem blight. These new varieties have been grown in trials at Auburn, the E. V. Smith Research Center, and four substations of the Alabama Agricultural Experiment Station, and in the Southern Cooperative Watermelon Variety Trials in other Southern States.

Disease Resistance

AU-Jubilant and AU-Producer have been rated for resistance to race 2 anthracnose, Fusarium wilt, and gummy stem blight in tests at locations in Alabama and other Southern States, table 1. Resis-

TABLE 1. DISEASE INDEX RATINGS FOR RESISTANCE TO ANTHRACNOSE, FUSARIUM WILT, AND GUMMY STEM BLIGHT

Cultivar or breeding line	Disease index[1]			
	Anthracnose race 2	Fusarium wilt	Gummy stem blight	Average
AU-Jubilant	2.5	3.0	2.2	1.63
AU-Producer	2.1	1.0	1.7	1.20
Charleston Gray	5.0	3.0	5.0	3.25
Crimson Sweet	5.0	3.0	5.0	3.25
Jubilee	5.0	3.0	5.0	3.25

[1]Disease index: 0 = no injury to 5 = all plants severely injured.

tance to race 2 anthracnose and gummy stem blight was incorporated into the breeding lines through screening programs which utilized an incubation chamber and greenhouse to eliminate susceptible plants from the populations (*1,3,5,6*). Multiple disease resistance of

AU-Jubilant and AU-Producer has been excellent in field plantings. Resistance to race 2 anthracnose and gummy stem blight was secured from PI 271778 and PI 189225 for AU-Jubilant and AU-Producer, respectively.

Fruit Characteristics

The fruit of AU-Jubilant are large and symmetrically elongate with uniform diameter for the length of the melon. Fruit are larger than Charleston Gray, Jubilee, and Crimson Sweet, table 2. Sizes are mostly in the 20- to 35-pound range, but weights of 40 pounds are not uncommon. The rind has a light green (138C[2]) background with dark green (136B[2]) stripes continuous for the length of the fruit. The rind is hard and tough and about 4/5 inch thick. The flesh is bright red (46C[2]) and firm, but not tough. Taste tests indicated that the edible quality of AU-Jubilant (color, texture, and taste) was higher than for Charleston Gray, Jubilee, and Crimson Sweet.

Fruit of AU-Producer are round to oblong-round with few culls. Melons are larger than Crimson Sweet, table 2. Sizes are mostly in the 20- to 30-pound range, but weights of 35 pounds are not uncommon. The rind is smooth, hard, and tough, and about 3/4 inch thick. The rind color is light green (138B[2]) with dark green stripes (136A[2]). The flesh is dark red (46B[2]) and firm, but not tough. Fruit quality, as indicated by total soluble solids, was higher for AU-Producer than for the other varieties, table 2. Taste tests for edible quality (color, texture, and taste) were also higher for AU-Producer.

Yield of fruit was highest for AU-Jubilant, table 2. Yield of fruit was higher for AU-Producer than for Crimson Sweet and Jubilee and comparable to Charleston Gray. Fruit weight was highest for AU-Jubilant. Fruit weight was greater for AU-Producer than for Crimson Sweet.

Both AU-Jubilant and AU-Producer are homozygous and can be propagated by seed. Pollination is dependent primarily on honeybees. Should the native bee population be inadequate, additional bees will be required for normal-shaped fruit and high yields.

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[2]Colour Chart, The Royal Horticulture Society, London.

TABLE 2. YIELD AND FRUIT CHARACTERISTICS OF VARIETIES OF WATERMELON AT FIVE LOCATIONS IN ALABAMA, 1978-84

Cultivar or breeding line	Yield/ acre	Fruit weight	Soluble solids[1]	Quality preference[2]	Width length ratio	Rind thickness	Rind firmness[3]	Days to maturity	Rind color
	Lb.	*Lb.*	*Pct.*			*In.*	*kg/cm²*		
AU-Jubilant	42,455a[4]	24.9a	11.3b	8.0	0.43	0.82	22.7	85	Striped
AU-Producer	38,677b	20.3c	11.8a	8.1	.84	.75	20.7	77	Striped
Charleston Gray	36,477b	21.8b	11.2cb	7.5	.44	.56	23.3	80	Gray
Crimson Sweet	30,828c	18.0d	11.1c	7.9	.62	.86	20.0	80	Striped
Jubilee	30.429c	22.6b	10.7d	7.6	.43	1.00	19.1	90	Striped

[1]Total soluble solids determined with Bausch and Lomb refractometer, 0-25 percent scale.
[2]Response index: 9-10 = excellent, 7-8 = good, 5-6 = acceptable, and below 5 = unacceptable.
[3]Puncture test performed with Instron 1122 Instrument, 1-cm² Magnus Taylor probe. Puncture made at 5-cm intervals beginning at stem end.
[4]Mean separation within columns by Duncan's multiple range test, 5 percent level.

SUMMARY

AU-Jubilant and AU-Producer are superior to the current varieties of their type in yield, quality, and disease resistance. They are multiple disease resistant, with resistance to race 2 anthracnose, Fusarium wilt, and gummy stem blight. The varieties are being released to broaden the base of high quality melons available to growers in the Southern United States. Because of AU-Producer's early maturity, it fits well into the commercial production program to lengthen the shipping season for any given production area or grower.

AVAILABILITY OF SEED

Exclusive releases of AU-Jubilant and AU-Producer were made to Hollar and Company, Inc., Rocky Ford, Colorado 81067, for production and marketing of seed. Growers and home gardeners can find high quality seed at local wholesale and retail outlets.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the assistance of Grover B. Sowell, Jr., Research Pathologist, USDA Southeastern Regional Plant Introduction Station, Experiment, Georgia, for discovery of resistance to *Didymella bryoniae* and *Colletotrichum laganarium*, race 2, and for counseling in screening techniques with the disease organisms. Essential assistance was rendered by H. M. Bryce, E. V. Smith Research Center, Shorter, Alabama; and C. C. Carlton, J. A. Pitts, and K. C. Short, Chilton Area Horticulture Substation, Clanton, Alabama, in increasing seed for grower trials and conducting variety trials.

Valuable assistance in conducting yield trials was rendered by M. H. Hollingsworth, North Alabama Horticulture Substation, Cullman, Alabama; E. L. Carden, F. B. Selman, and R. L. McDaniel, Gulf Coast Substation, Fairhope, Alabama; and J. G. Starling and H. W. Ivey, Wiregrass Substation, Headland, Alabama.

Assistance of growers in conducting production trials is deeply appreciated, as is the assistance of participants in the Southern Cooperative Watermelon Variety Trials.

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APPENDIX

APPENDIX TABLE 1. AVERAGE YIELD PER ACRE OF WATERMELON CULTIVARS AND BREEDING LINES AT FIVE LOCATIONS IN ALABAMA, 1978-84

Cultivar or breeding line	Yield, by location					
	E.V. Smith Research Center	Clanton	Cullman	Fairhope	Headland	Average
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Charleston Gray ...	52,132a[1]	33,854b	36,900a	27,468b	29,489c	36,467b
Jubilee	42,937b	23,196c	30,368a	38,389b	26,178c	30,429c
Crimson Sweet	39,983b	27,042c	29,630a	28,800b	27,320bc	30,828c
AU-Jubilant	56,882a	38,139a	38,204a	38,939a	38,339a	42,455a
AU-Producer	54,814a	34,250b	37,470a	33,061ab	31,006b	38,677b

[1]Mean separation within columns by Duncan's multiple range test, 5 percent level.

APPENDIX TABLE 2. AVERAGE FRUIT WEIGHT OF WATERMELON CULTIVARS AND BREEDING LINES AT FIVE LOCATIONS IN ALABAMA, 1978-84

Cultivar or breeding line	Average fruit weight, by location					
	E.V. Smith Research Center	Clanton	Cullman	Fairhope	Headland	Average
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Charleston Gray ...	23.41c[1]	23.74b	19.80c	21.41b	19.97b	21.79b
Jubilee	25.06b	22.94b	21.60ab	22.64ab	19.26bc	22.55b
Crimson Sweet	19.64d	19.42c	17.42d	17.12d	18.01d	21.79b
AU-Jubilant	26.99a	25.76a	22.97a	24.24a	23.76a	24.85a
AU-Producer	22.55c	20.81bc	20.29bc	18.62c	18.38c	20.28c

[1]Mean separation within columns by Duncan's multiple range test, 5 percent level.

APPENDIX TABLE 3. TOTAL SOLUBLE SOLIDS OF WATERMELON CULTIVARS AND BREEDING LINES AT FIVE LOCATIONS IN ALABAMA, 1978-84[1]

Cultivar or breeding line	Total soluble solids, by location					
	E.V. Smith Research Center	Clanton	Cullman	Fairhope	Headland	Average
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
Charleston Gray ...	11.39b[2]	10.98bc	11.21b	11.06b	11.23bc	11.17cb
Jubilee	10.69c	10.65d	10.85c	10.58c	10.39d	10.66c
Crimson Sweet	11.40b	10.77cd	11.38ab	11.14b	11.03c	11.14c
AU-Jubilant	11.65b	11.15b	11.12bc	11.26ab	11.35b	11.31b
AU-Producer	12.18a	11.49a	11.66a	11.63a	12.12a	11.81a

[1]Total soluble solids determined with Bausch and Lomb refractometer, 0.25 percent scale.
[2]Mean separation within columns by Duncan's multiple range test, 5 percent level.

APPENDIX TABLE 4. RESPONSE OF TASTE PANEL TO QUALITY OF WATERMELON CULTIVARS AND BREEDING LINES, AUBURN, ALABAMA, 1982

Cultivar or breeding line	Color	Texture	Flavor	Average
AU-Jubilant	8.1[1]	8.1	7.7	7.97
AU-Producer	7.8	8.1	8.4	8.10
Charleston Gray	7.5	7.8	7.1	7.47
Crimson Sweet	7.8	8.0	8.0	7.90
Jubilee	7.6	7.9	7.3	7.60

[1]Response index: 9-10 = excellent, 7-8 = good, 5-6 = acceptable, below 5 = unacceptable.

APPENDIX TABLE 5. FLESH COLOR OF WATERMELON CULTIVARS AND BREEDING LINES, AUBURN, ALABAMA, 1982[1]

Cultivar or breeding line	Hearts			Subseed		
	L	a	b	L	a	b
AU-Jubilant	43.55	31.05	15.33	39.92	29.75	14.60
AU-Producer	39.29	29.55	14.85	39.23	24.53	15.08
Charleston Gray	39.16	30.95	15.25	38.84	27.17	14.73
Crimson Sweet	38.27	28.58	14.60	38.19	23.97	14.60
Jubilee	41.77	29.46	15.15	38.84	27.17	14.73

[1]Hunter color difference values standardized to red plaque; L = 68.7, a = 23.0, and b = 9.4 where L = total light reflectance, a = red, and b = yellow.

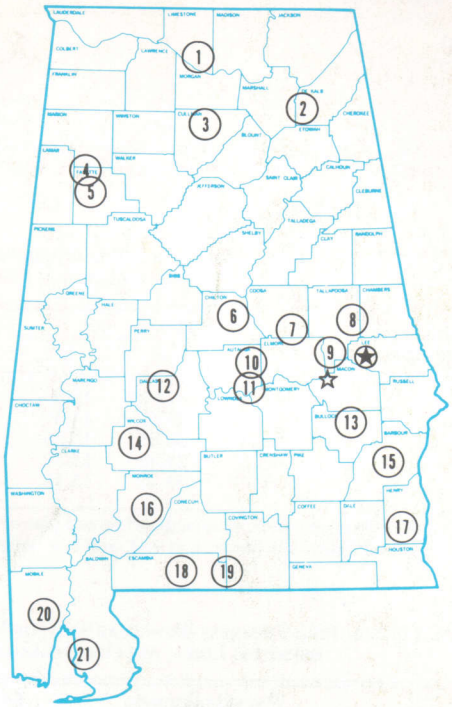
APPENDIX TABLE 6. RIND FIRMNESS (PUNCTURE TEST) OF WATERMELON CULTIVARS AND BREEDING LINES, AUBURN, ALABAMA, 1982[1]

Cultivar or breeding line	Top side firmness			Ground side firmness			Average
	Stem end	Middle	Blossom end	Stem end	Middle	Blossom end	
	kg/cm²	*kg/cm²*	*kg/cm²*	*kg/cm²*	*kg/cm²*	*kg/cm²*	*kg/cm²*
AU-Jubilant	60.4	58.4	34.2	58.0	55.6	33.3	50.00
AU-Producer	28.5	28.0	20.3	27.2	26.3	19.7	20.67
Charleston Gray	27.8	26.9	17.0	26.7	25.4	15.7	23.25
Crimson Sweet	24.6	23.5	13.7	23.4	22.6	12.3	20.02
Jubilee	23.4	22.6	12.5	22.8	21.5	11.6	19.10

[1]Puncture test performed with Instron 1122 Instrument, 1-cm² Magnus Taylor probe. Puncture made at 5-cm intervals beginning at stem end.

Alabama's Agricultural Experiment Station System
AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.
☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Chilton Area Horticulture Substation, Clanton.
7. Forestry Unit, Coosa County.
8. Piedmont Substation, Camp Hill.
9. Plant Breeding Unit, Tallassee.
10. Forestry Unit, Autauga County.
11. Prattville Experiment Field, Prattville.
12. Black Belt Substation, Marion Junction.
13. The Turnipseed-Ikenberry Place, Union Springs.
14. Lower Coastal Plain Substation, Camden.
15. Forestry Unit, Barbour County.
16. Monroeville Experiment Field, Monroeville.
17. Wiregrass Substation, Headland.
18. Brewton Experiment Field, Brewton.
19. Solon Dixon Forestry Education Center, Covington and Escambia counties.
20. Ornamental Horticulture Substation, Spring Hill.
21. Gulf Coast Substation, Fairhope.